

What is claimed is:

1. A knock detection device comprising: cylinder pressure detecting means for detecting cylinder pressure in an internal combustion engine; threshold value  
5 computing means for computing a knock detection threshold value based on cylinder pressures for a plurality of cycles detected by said cylinder pressure detecting means; and knock occurrence determining means for determining the occurrence or non-occurrence of knock,  
10 based on said threshold value computed by said threshold value computing means, wherein said knock detection device further comprises:

maximum cylinder pressure detecting means for detecting a maximum cylinder pressure in each cycle  
15 from said cylinder pressures detected by said cylinder pressure detecting means;

maximum cylinder pressure fluctuation detecting means for detecting a maximum cylinder pressure fluctuation in each cycle from said cylinder pressures  
20 detected by said cylinder pressure detecting means; and

heavy knock occurrence determining means for determining the occurrence or non-occurrence of heavy knock in a given cycle, based on said maximum cylinder pressure fluctuation detected by said maximum cylinder pressure fluctuation detecting means and said maximum  
25 cylinder pressure detected by said maximum cylinder pressure detecting means.

2. A knock detection device as claimed in claim 1, wherein said heavy knock occurrence determining means  
30 determines that heavy knock has occurred in said given cycle when said maximum cylinder pressure fluctuation detected by said maximum cylinder pressure fluctuation detecting means is equal to or larger than an n-th submultiple of said maximum cylinder pressure detected by  
35 said maximum cylinder pressure detecting means, where n is a prescribed value larger than 1.

3. A knock detection device as claimed in claim 2,

wherein said larger-than-1 prescribed value to be used in said heavy knock occurrence determining means is set as a function of the number of revolutions of said internal combustion engine.

5           4. A knock detection device as claimed in claim 2, further comprising learning means for learning said larger-than-1 prescribed value to be used in said heavy knock occurrence determining means, based on past operating conditions and knocking conditions.

10           5. A knock detection device as claimed in any one of claims 1 to 4, wherein said maximum cylinder pressure detecting means detects a difference between a maximum cylinder pressure value and a minimum cylinder pressure value within each cycle as said maximum cylinder  
15           pressure.

          6. A knock detection device comprising: a cylinder pressure sensor for detecting cylinder pressure in an internal combustion engine; a threshold value computing unit for computing a knock detection threshold value  
20           based on cylinder pressures for a plurality of cycles detected by said cylinder pressure sensor; and a knock occurrence determining unit for determining the occurrence or non-occurrence of knock, based on said threshold value computed by said threshold value  
25           computing unit, wherein said knock detection device further comprises:

          a maximum cylinder pressure detecting unit for detecting a maximum cylinder pressure in each cycle from said cylinder pressures detected by said cylinder  
30           pressure sensor;

          a maximum cylinder pressure fluctuation detecting unit for detecting a maximum cylinder pressure fluctuation in each cycle from said cylinder pressures detected by said cylinder pressure sensor; and

35           a heavy knock occurrence determining unit for determining the occurrence or non-occurrence of heavy knock in a given cycle, based on said maximum cylinder

pressure fluctuation detected by said maximum cylinder pressure fluctuation detected unit and said maximum cylinder pressure detected by said maximum cylinder pressure detecting unit.

5           7. A knock detection device as claimed in claim 6, wherein said heavy knock occurrence determining unit determines that heavy knock has occurred in said given cycle when said maximum cylinder pressure fluctuation detected by said maximum cylinder pressure fluctuation  
10 detecting unit is equal to or large than an n-th submultiple of said maximum cylinder pressure detected by said maximum cylinder pressure detecting unit, where n is a prescribed value larger than 1.

15           8. A knock detection device as claimed in claim 7, wherein said larger-than-1 prescribed value to be used in said heavy knock occurrence determining unit is set as a function of the number of revolutions of said internal combustion engine.

20           9. A knock detection device as claimed in claim 7, further comprising a learning unit for learning said larger-than-1 prescribed value to be used in said heavy knock occurrence determining unit, based on past operating conditions and knocking conditions.

25           10. A knock detection device as claimed in any one of claims 6 to 9, wherein said maximum cylinder pressure detecting unit detects a difference between a maximum cylinder pressure value and a minimum cylinder pressure value within each cycle as said maximum cylinder pressure.